FIRE PROTECTION GUIDELINES
FOR
WILDLAND RESIDENTIAL INTERFACE
DEVELOPMENT

The guidelines in this document have been adopted by:

Montana Fire Chiefs Association
Montana County Fire Wardens Association
Montana Fire Districts Association

July, 1993

PART I INTRODUCTION

101 WILDFIRE PROTECTION

In Montana, summer typically brings the fire season _ the result of low rainfall, high temperatures, low humidities, and summer thunderstorms. Nevertheless, major wildfires can occur at any time of the year. Varied topography, semi-arid climate, and numerous human-related sources of ignition make this possible. But Montanans can readily protect lives, property, natural resources, and scenic beauty and greatly facilitate the work of fire suppression organizations by following the guidelines offered in this publication.

Both the Montana Department of State Lands and State Fire Marshal recommend that these guidelines be adopted by local government, fire protection agencies, planners, developers, and homeowners. But because Montana is so large and diverse in terrain, vegetation and weather, it is important that the guidelines be applied with flexibility and in consultation with local fire experts. In some cases, certain trade-offs may be possible. For example, residential sprinklers may be used to compensate for a reduction in driveway width; a wide road with numerous turnouts may suffice, rather than a separate road for access and egress which may not be possible or very expensive to construct. Although our goal must be the protection of life, property, and resources, there may be several alternatives to achieving that end.

102 WILDLAND RESIDENTIAL INTERFACE

Since the mid-1960's, and particularly in the last 10 to 15 years, people have subdivided and developed wildlands for residential, recreational and commercial uses. This development has created many communities mixed with wildland vegetation. Fire Protection Specialists call these areas the Wildland Residential Interface (WRI).

A WRI fire situation exists anywhere that structures are located close to natural vegetation. A fire can spread from the vegetation to structures or vice-versa. A WRI can vary from a large housing development adjacent to natural vegetation to a structure(s) surrounded by natural vegetation. There are two general categories of WRI:

1. Boundary WRI - An area where a clearly defined, linear boundary of homes meets wildland vegetation. Typically, we find this sort of interface on the fringe of large towns.

2. Intermix WRI - An area where structures are scattered among or mixed with wildland vegetation, without a clearly defined boundary. Typically, we find the intermix WRI in rural areas where people have subdivided wildlands into small parcels of 1 to 40 acres.

103 COMMON PROBLEMS

Fire protection agencies, local governments, developers, planners, and landowners must work together to improve fire protection in the WRI. Some common problems are:

1. Responsibilities and jurisdictions of different fire protection agencies are sometimes unclear.

2. The responsibilities of the developer, planner, and landowner are not well defined. Few people who live, plan, and develop in the interface recognize the wildfire hazards. Consequently, they seldom invest in appropriate fire prevention measures.

3. Frequently no agency takes the responsibility for adopting or enforcing local and State fire regulations.

4. Firefighters often find inadequate roads, insufficient water, and a build-up of natural fuels.

5. Some WRI areas have no organized fire protection agency.

Wildfire disasters in WRI areas are common in many parts of the nation, and the problem is increasing. This can be corrected only through comprehensive planning that includes housing development design, fuels management, and public education. A fire suppression organization by itself will not suffice.

The following guidelines describe how to reduce risk by reducing and managing the buildup of fuels, building and maintaining adequate road systems, providing adequate water to firefighters, and using fire-resistant materials and designs for homes and outbuildings.

PART II GUIDELINES

200 APPLICATION

The following guidelines apply to all developments in the WRI, including residential, commercial, and recreational developments on private, State, and Federal lands. The guidelines should be used in conjunction with local fire authorities to safeguard homes and developments in a specific locale.

201 VEGETATION REDUCTIONS AND CLEARANCE

Trees, brush and dense undergrowth are the primary fire hazards. This vegetation can ignite readily, burn with intense heat, and promote rapid spread of fire. Vegetation must be managed so as to reduce exposure of structures to flames and radiant heat during a wildfire. The reduction of flammable vegetation and other hazards around buildings provides a "defensible space" for firefighters and residents. As a minimum, developers and landowners should:

1. Create a defensible space by:

a. Determining the slope of the building site.

. b. Use the vegetation-slope charts (Appendices A-D) as a guide. Reduce and remove vegetation around each building according to the slope. Single ornamental trees or shrubs need not be removed as long as all vegetation near them is reduced according to the guideline. Ornamental trees and shrubs should not touch any buildings.

c. When planting select trees, shrubs, and vegetation that limit or retard fire spread as suggested below:

i.Perennial: Choose hardy perennial flowers that are adapted to our climate. These green, leafy, succulent plants are difficult to burn. Watering and regular weeding improves fire resistance.

ii.Shrubs: Evergreen shrubs such as dwarf conifers or junipers tend to ignite easily; avoid them unless well spaced.

iii.Trees: Deciduous trees can be clumped, scattered, or planted in greenbelts or windbreak patterns. Evergreen trees tend to ignite easily and should be spaced in accordance with the landscaping guidelines. (Appendices A-D).

d. Montana Fire Hazard Reduction Law requires that any person who creates a slash fire hazard as a result of logging or thinning must reduce or manage the hazard. Contact the Montana Department of State Lands for legal requirements and assistance in reducing any identified hazards.

2. Roadside Vegetation:

Maintain roadside vegetation to protect roads from radiant heat, so they can be used both as escape routes and fire breaks (Figure 1). Local conditions will dictate how much vegetation to clear. It is suggested that developers, landowners, and local officials:

a. Thin trees to 10 feet between crowns.

b. Remove ladder fuels and prune tree limbs up to 15 feet, or one-third of the live crown of the tree, whichever is less.

c. Remove dead vegetation, logs, snags, etc. Remove snags to a distance that prevents hem from falling into cleared right-of-way or on roads.

c. In the clear zone and where practical, reduce brush, grass, and other vegetation and maintain it at a maximum of 12 inches high.

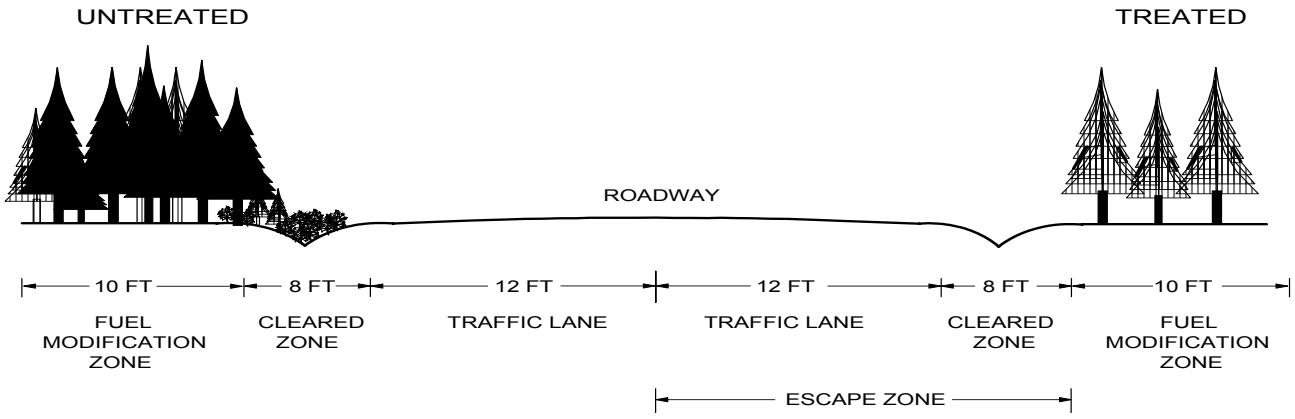


Figure 1 - Recommended treatment for roadside vegetation.

In an emergency, all road systems shall provide for unobstructed traffic circulation for residents, firefighters, and fire equipment. This requires wide, well-constructed roads with sufficient turnarounds to prevent getting stuck off the road, and to allow simultaneous access by emergency vehicles and escape by local residents. Turns must be designed and hill grades established with truck traffic in mind. Fire departments must be able to drive close to residences. Narrow, private roads, while picturesque and inexpensive to build, reduce access and limit the ability of emergency vehicles to respond quickly.

1. Access Routes

All developments should have more than one access route. Access routes should allow two-way traffic so fire equipment can move in and people move out of an area in an emergency. Access route design should consider escape routes and safety zones. Roads should be designed to meet county standards, if the standards allow for adequate two-way traffic.

2. Primary Roads

Primary roads should be designed and built as follows (Figure 2):

a. An adequate right-of-way, consisting of:

i. Two 12-foot wide driving lanes.

ii. Two 8-foot wide zones clear of vegetation. [see Section 201(2).]

iii. Two 10-foot wide zones of reduced vegetation. [see Section 201(2).]

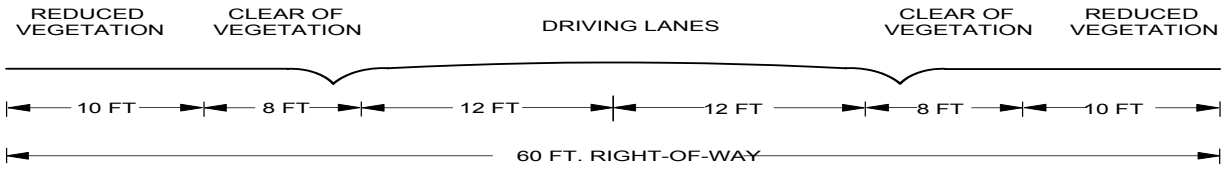


Figure 2 - Primary road right-of-way.

3. Secondary Roads

Secondary roads should be designed and built as follows (Figure 3):

a. An adequate right-of-way, consisting of:

i. Two 10-foot wide driving lanes.

ii. Two 4-foot wide zones clear of vegetation. [See Section 201 (2).]

iii. Two 8-foot wide zones of reduced vegetation. [See Section 201 (2).]

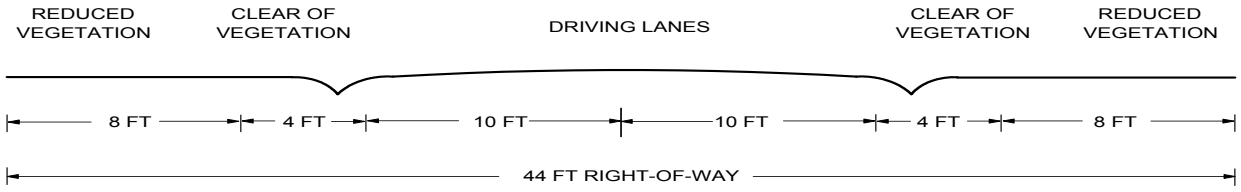


Figure 3 - Secondary road right-of-way.

4. Rights-of-way

Strive to dedicate all rights-of-way to the county in which they are built. If the county is not accepting rights-of-way, an agency or organization should be designated to be responsible for right-of-way maintenance.

a. Easements and rights-of-way should be of sufficient width to accommodate the traveled way, shoulders, parking spaces, vegetation modification, and other local requirements along the road or street.

5. Emergency Service Access to Individual Lots and Driveways

Driveways should be constructed as follows (Figure 4):

a. A minimum unobstructed driving surface of 12 feet and a vertical clearance of 15 feet for driveways less than 300 feet and a 16 foot driving surface for any driveway over 300 feet.

b. A 4-foot wide zone of reduced vegetation on each side of the driving surface is desirable.

c. Turnaround space should be provided at all building or structure sites on driveways over 300 feet in length.

   i. A turnaround should be within 50 feet of the building or structure when there is no community water supply with fire hydrants.

   ii. A turnaround should be within 150 feet of the building or structure when there is a community water supply with fire hydrants.

d. If the driveway is less than 16 feet wide turnouts, should be designed and constructed every 300 feet along the driveway's length.

e. The opening through a gate should be two feet wider than the road.

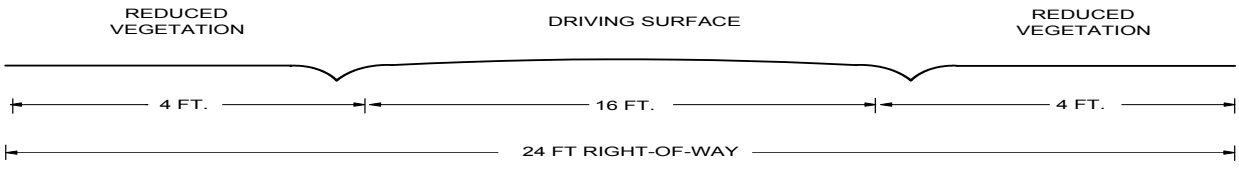


Figure 4 - Individual lots and driveway access.

6. Cul-de-sacs

a. In areas of extreme fire hazard classification, as determined by the local fire authority, the length of a road ending in a cul-de-sac T shall not exceed 600 feet (Figure 5). In all other areas the maximum length will be 1,000 feet.

b. End all cul-de-sacs with a clearance of at least 90 feet in diameter (45' radius).

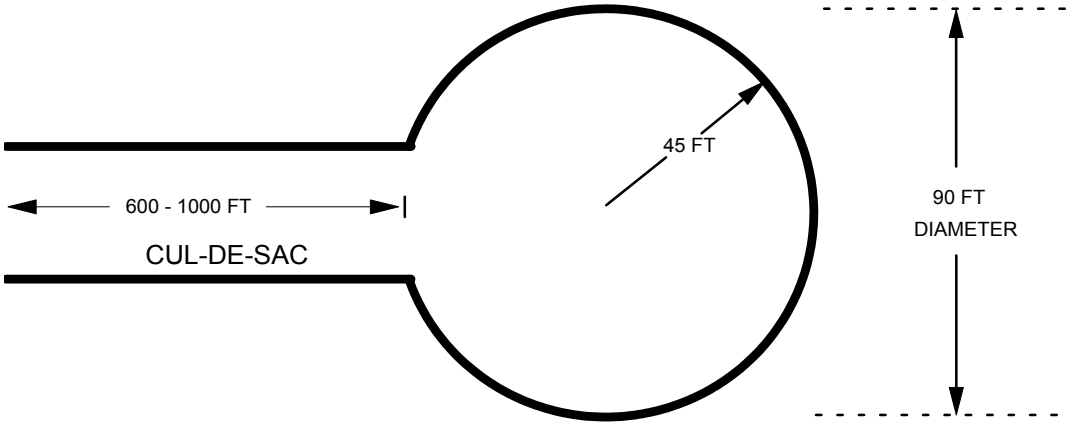
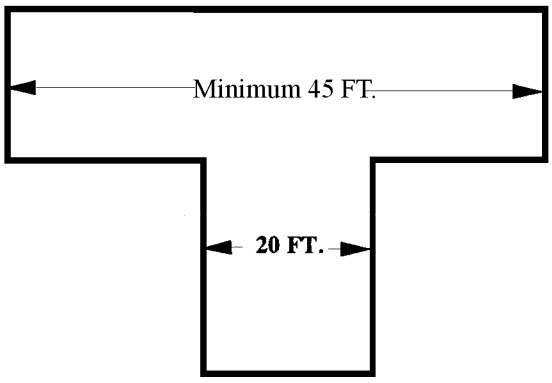


Figure 5 - Cul-de-sac specifications.

7. Hammerhead T Turnarounds

a. Hammerhead-T designed turnarounds must provide emergency vehicles with a 3-point turnaround capability. In areas of extreme fire hazard classification, as determined by the local fire authority, the length of a road ending in a Hammerhead T shall not exceed 600 feet (Figure 6). In all other areas the maximum length will be 1,000 feet.

b. Maintain a minimum of 45 feet in length and 20 feet in width of turnaround area.



8. Road Grades

Road grades often will determine what type of emergency fire equipment (if any) can access an area. The desirable road grades should be no greater than 8 percent. However, many factors influence the building of roads, and an 8 percent grade is not always possible or practical. Roads greater than 10 percent may be allowed upon approval by the local fire authority and should consider the following:

a. Roads with grades steeper than 10 percent should only be allowed when there is no alternative and upon approval of the local fire authority.

b. In steep areas where roads cannot be built on grades of 10 percent or less, keep the steeper roads as short as possible.

c. All roads with a grade steeper than 10 percent should be graded and surfaced and of sufficient design to support the weight of 20-ton vehicles.

9. Road and Driveway Intersections

a. Build road intersections as close to 90 degrees as possible (Figure 7).

b. Build all roads straight for a distance of 80 feet from any intersection.

c. Avoid building an intersection at an angle less than 45 degrees.

10. Road Curve Radius

Fire equipment is as varied as road conditions. Consult the local fire authority and design the road to accommodate present and planned developments in terms of getting fire equipment in and people out in the case of an emergency. In general, build road curves in a radius of 100 feet or more (Figure 7).

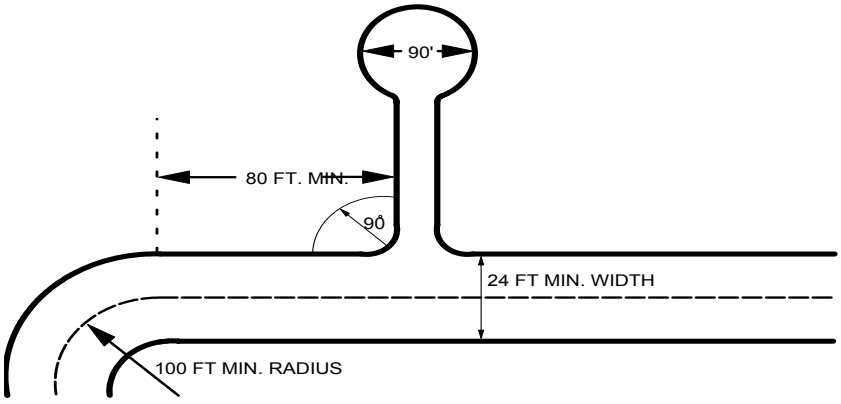


Figure 7 - Road curve specifications.

11. Bridges

a. Build bridges as wide as the roads or driveways they connect (Figure 7).

b. At primary entrances and exits of developed areas, build or reinforce all bridges to a design load of 40 tons (80,000 pounds) minimum.

c. Build or reinforce all other bridges within developments to a design load of 20 tons (40,000 pounds).

d. Build all bridges using non-flammable materials.

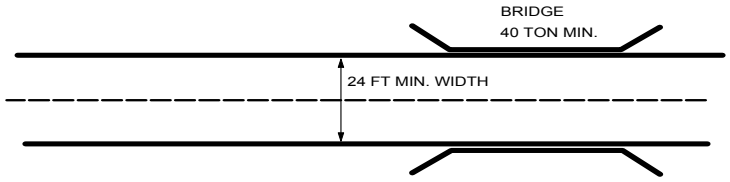


Figure 8 - Primary road bridge specifications.

203 WATER STORAGE AND SUPPLY

Water is the single most important factor in suppressing structure fires. Water also plays an important role in suppressing wildland fires. Every community should store and supply water in a broadly-based system.

1. Fire Hydrants

If hydrants are planned, install hydrants of the size and type and in locations determined by the local fire authority or jurisdiction, or use the following general guidelines:

a. In interface areas of 0 to 2 homes per acre, install fire hydrants no more than 660 feet apart. The hydrant system must maintain a minimum flow of 500 gallons per minute.

b. In interface areas of more than 2 homes per acre, install fire hydrants no more than 330 feet apart. The hydrant system must maintain a minimum flow of 750 gallons per minute.

c. In areas where the fire authority having jurisdiction has declared a high, very high, or an extreme fire hazard, provide fire hydrants with 30 psi of residual water pressure.

d. In areas where the fire authority having jurisdiction has declared a low or moderate fire hazard, provide fire hydrants with 20 psi of residual water pressure.

e. Store and supply enough water to flow through hydrants at the required rate for at least 2 hours. This is in addition to the maximum daily flow that the area needs for domestic water.

2. Water Mains

a. When hydrants are required, use only waterways at least 6 inches in diameter.

b. Install gate valves to connect the water mains and fire hydrants.

c. Replace smaller water mains with ones that meet this standard.

d. Install water mains that permit circulating water flow.

3. Individual Water Storage and Supply

It is recommended that in WRI areas where homes have an independent water supply, such as an individual well and pump, developers and owners should provide for adequate storage and supply of water for firefighting purposes.

a. Developers and owners can use cisterns, swimming pools, tanks, lakes, ponds, streams, etc. to store water.
b. Store at least 2,500 gallons of water per residence in addition to the domestic

water source.

c. Attach a dry hydrant or provide a draft opening to the 2,500 gallon water source. For lakes, ponds, and streams, provide fire engine access as below and install dry hydrants where possible.

d. Locate the water source where fire engines can easily reach it. On level ground, fire engines must be able to get within 10 feet of the water source to be able to use it effectively.

e. Install at least two 3/4-inch hose outlets for each building.

f. Landowners must consult with the local fire authorities to see if they need to operate a water shuttle. If so, develop the shuttle areas as specified.

g. Equip any electrical pump with a reliable backup electrical generator or an alternative gasoline-powered pump.

h. Firefighters must be able to find the water source. Document each source of water on the plans of the development, home, or other structure(s), and give this documentation to the local fire authority.

i. Protect the structures that house water storage or water supply, per Sections 201, 205, and 206.

4. Residential Sprinklers

Residential sprinkler systems provide excellent fire protection. These systems should be considered when evaluating the fire safety of homes. Fire authorities could consider installation of residential sprinkler systems as a trade-off for other fire protection measures.

Contact your local fire authorities to discuss residential sprinkler systems for the protection of your home. Be sure a licensed contractor designs and installs the sprinkler system.

Fire authorities having jurisdiction may require developers or landowners to store or supply water beyond the guidelines detailed above. These address only the minimum water storage and supply guidelines.

WRI fire protection may rely on fuelbreaks and greenbelts to separate communities, groups of structures, or individual homes. These breaks can slow or stop the spread of an oncoming fire. Locate fuelbreaks and greenbelts to protect both existing and planned developments and adjacent wildlands.

Good landscaping design can incorporate vegetation or fire fuelbreaks in planned developments. These fuelbreaks should not be a bare soil trail bulldozed around a subdivision, but can be as simple as the removal of dead and fallen trees, tree limbs, shrubs and other flammable vegetation together with breaking the continuity of vegetation in a band 100-300 feet around the development.

One of the most effective means of providing fire protection is the use of open spaces and public use areas such as parks, recreation sites, picnic areas, and perimeter roads to break fuel continuity.

Natural features such as rocky formations with little or no vegetation, rivers or streambeds in which vegetation has been thinned and dead and dying materials removed can also be utilized in an overall subdivision landscaping plan to help retard an advancing wildfire.

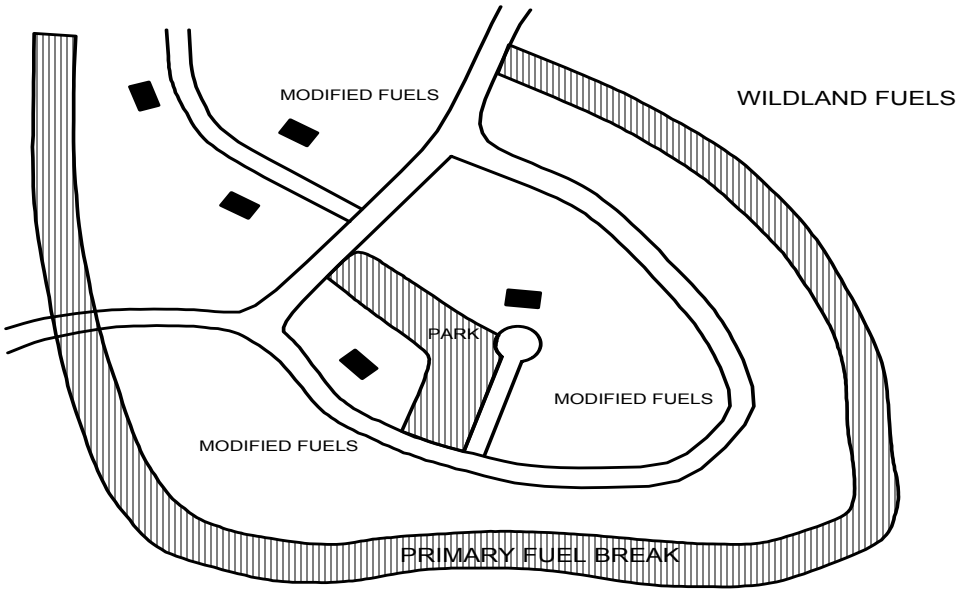


Figure 9 - Fuel breaks and fuel modifications designed to protect a development.

205 ROOF CONSTRUCTION

Wildfire can produce exceptionally strong winds that can carry particles up to a mile from the fire front. These airborne fire brands landing on a roof can ignite the building and threaten other structures. Roof material is more critical than roof construction. Consider the following elements:

1. *Use only Class A or B fire-rated roofing materials.

2. Never use untreated wood shakes or shingles.

3. Where practical, build all roofs with the minimum of a 4 in 12 pitch.

4. If possible, avoid horizontal roofs.

*Wood shakes or shingles can achieve a Class B rating by using a foil-faced or equivalent substrate or underlayment of non-combustible material and when the shakes are periodically treated with fire retardant. Follow manufacturer's treatment guidelines and re-treat as specified.

FIRE RATING OF ROOFING MATERIALS

Fire Rating	Type of Material	Spread Index ***
Class A	Slate Rock shingle Concrete tile Fiberglass based: - asphalt shingle - rolled roofing	0-25
Class B	Aluminum shingle Aluminum or steel panels Periodically treated - wood shingle or shake plus heat barrier	26-75
Class C	Felt-tar based - asphalt shingle - rolled roofing Asphalt tar gravel Periodically Treated - wood shake - wood shingle	76-200
Not Rated	Untreated wood shingle or shake	200++

The Spread Index is determined by the UL Tunnel Test that uses samples of 20 inches by 25 feet of building materials and compares the Flame Spread to Asbestos Cement Board (rated as 0) and uncoated red oak (rated as 100).

The National Fire Protection Association (NFPA) has adopted these classifications based on the American Society for Testing and Materials ASTM-E-84 (UL Tunnel) test results. Federal, State, and local authorities accept these classifications.

All buildings in the WRI shall be designed and constructed to comply with the Uniform Building Codes (UBC) and the Uniform Fire Codes (UFC).

1. Eaves, Balconies, Decks, Unenclosed Roofs, and Floors

a. Protect the exposed underside of all eaves, balconies, and unenclosed roofs, decks, and floors with one hour fire-resistant materials.

b. Protect all supporting beams and posts, in stilt or cantilevered construction, with one hour fire-resistant materials.

2. Vents

a. Attic openings, soffit vents, foundation louvers, or other direct openings in outside walls, overhangs, or roofs should be no larger than 144 square inches.

b. Cover all openings in outside walls, overhangs, or roofs with a 1/4-inch non-combustible, corrosion-resistant metal mesh.

3. Chimneys

a. Install only an approved spark arrester around the mouth of the chimney, stovepipe, or vent of any heater, stove, or fireplace.

b. Clean spark arrester regularly to remove deposits.

4. Exterior Walls

Build outside walls out of one hour fire-resistant materials. Do not use shingles, shakes, or rough-cut wood siding to sheathe outside walls.

5. Exterior Rafters

Close off the spaces between outside rafters, wall plates, and the underside of the roof sheathing with wood at least two inches thick or equivalent solid blocking.

6. Windows

Wildfire can radiate through windows, heating the interior of houses to combustion temperature. It can heat, crack, and break the windows, letting in burning particles.

a. Keep window surface area to a minimum. In particular, since fire usually travels uphill, minimize window surface area on downhill-facing walls.

b. Build several small windows instead of one large window, as large windows are more vulnerable to fire damage.

c. Screen all windows.

207 BUILDING SPACING AND DENSITIES

The distance between structures directly affects how fast a wildfire can spread. Local governments, developers, owners, and responsible fire authorities should consider base spacing and density dependent on slope and fuels in the area of the structures.

1. Building Spacing

a. Residential structure spacing must meet county requirements. Attempt to space buildings, including mobile homes, at least 60 feet apart and at least 30 feet from the property line.

2. Building Densities

a. Locate buildings on each piece of property so that developers and homeowners can reduce vegetation in accordance with Section 201. General guidelines to meet the defensible space are:

   i. Slope 0% - 20% - A minimum 1 acre for a structure to be placed on lands in forest fuels.

   ii. Slope 21% - 30% - A minimum 1.5 acre for a structure to be placed on lands in forest fuels.

b. Never build structures in forest fuels where the slope is greater than 30%, at a canyon mouth, in a ridge saddle, or in other areas of extreme fire hazard.

208 BUILDING ADDRESSES AND ROAD SIGNS - NAMES AND NUMBERS

Clearly designate roads by names and buildings by numbers so emergency personnel can find the fire site quickly. All road signs and address numbers must be visible from the road.

1. Buildings

a. A building should clearly display the address number between 4 and 8 feet above the ground.

b. The use of only non-combustible material for address markers is recommended.

c. Personnel in emergency vehicles must be able to read the address from at least 100 feet. Number all buildings with script at least 4 inches high and at least 1/2-inch wide. The signs should be reflectorized and should contrast with the background color of the sign.

d. A cluster of buildings owned by the same person may share a single address.

2. Road and Street Signs

a. The State or county must install and maintain State and county road signs.

b. The owners of private roads must install and maintain approved private road signs.

c. The responsible party should place the approved road name on a sign between 4 and 8 feet off the ground, where it can easily be seen.

d. The use of only non-combustible material for road signs is recommended.

e. Personnel in emergency vehicles must be able to read the road name from at least 100 feet. Print all road signs with script at least 4 inches high and at least 1/2-inch wide. The signs should be reflectorized, and numbers should contrast with the background color of the sign.

209 UTILITIES

Most fires resulting from electrical lines seem to be caused by distribution lines, not transmission lines. In eastern Montana, however, transmission lines do cause some fires. On classified forest land, utility companies and individuals responsible for utilities, must maintain all rights-of-way in accordance with Rule VIII of the Montana Department of State Lands Forest Fire Regulations, which states:

> *All persons, firms or corporations who own, control, operate, or maintain electrical transmission or distribution lines shall, prior to the beginning of fire season each year, inspect said powerlines for hazards and risks, correct the fire hazards and risks found, and inform the recognized agency that necessary remedial actions have been accomplished.*

In addition and on all lands:

1. Distribution Circuit (Line)

a. Build, modify, or extend all distribution lines underground wherever practical.

b. For above-ground lines, vegetation in rights-of-way must be managed.

2. Transmission Circuit (Line)

a. Transmission lines of 34.5 kilovolts and greater cannot be placed underground. Rights-of-way should be free of fire hazards

GLOSSARY

Accessory Building or Structure- any building or structure used incidentally to another building or structure.

Cantilevered Construction- a method of constructing structures on a slope, where part of the structure rests on foundation set in the ground and part of the structure rests on posts rising from further down the slope.

Cistern - an underground water storage tank, usually buried below frost level.

Tree Crown - the primary and secondary branches growing out from the main stem, together with twigs and foliage.

Defensible Space - a designated area around a home or other structure the size of which is dependent on the vegetation, proximity of tree crowns, slope and distance to adjacent buildings. Within this area all weeds, dry grass, slash, flammable debris and flammable fuel is removed. This managed buffer surrounding buildings and structures is designed to reduce the chances of a fire spreading to or from the buildings or structures.

Draft Opening - an opening where firefighters can insert a standard size hose to pump water out.

Development - human-made improvement of property.

Distribution Circuit (Line) - high-voltage circuit between a main switchyard and the point of use.

Driveway - vehicular ingress and egress routes that serve no more than two buildings or structures, not including accessory structures, on one parcel containing no more than three dwelling units.

Dry Hydrant - a pipe that leads to a water source, but has no pressure of its own. Firefighters use dry hydrants to draft water from the water source to supply water to apparatus and pumps.

Easement - a legal right to use or enjoy, in a specific manner, land owned by someone else.

Fuel - a material that will readily support combustion. In the case of the Wildland Residential Interface, fuels are primarily wildland fuels - i.e., the natural vegetation that grows, dies, and accumulates, but may also include structures, wood piles, yard accumulations, etc.

Fuelbreak - a strip of land where the natural fuels have been greatly reduced or thinned.

Gate Valve - a device that can be moved to open or shut off the flow of water.

Greenbelt - a strip of land with lawn or other small quantities of non-native vegetation. Examples: golf courses, mowed parks, riverbank paths, etc.

Hazard - the combination of accumulated fuels, weather, and topography patterns which contribute to the potential fire intensity, should an ignition occur.

Interface - see Section 102.

Intermix - see Section 102.

Landowner - anyone who owns land, whether they have built on it or not. This includes corporations, private individuals, public agencies, real estate agencies, etc.

Local (Government) Officials - city councils, county commissioners, county surveyors, mayors, planning departments, sheriffs, zoning departments, etc.

Primary Access Road - a main entry and exit road. Usually the road(s) that leads into the development from a highway, county road, or major arterial. Must provide for unobstructed traffic circulation during an emergency.

Rights-of-way - a strip of land on which a public road is built, or which a railroad or public utility has the legal right to use.

Risk - the chance of a fire starting because there is a causative agent; the causative agent itself.

Secondary Road - a road that leaves a primary access road to reach homes, buildings, recreational sites, etc. that lie away from the primary road. Driveways longer than 600 feet are considered as secondary roads.

Sheathing - materials that cover the exterior walls and roof of a structure - i.e., wood, metal.

Soffit - the under surface of a horizontal part of a structure, such as the bottom of an overhang or the bottom of a staircase.

Spark Arrester - a welded or woven wire mesh screen with openings no larger than 1/2-square inch, used to filter burning particles from smoke.

Stilt Construction - a method of construction where the structure rests on posts rising up from the ground.

Structure - any building - home, business, storage building, barn, shed, etc.

Transmission Circuit (Line) - a very high voltage circuit between the generating source and the switchyard (substation).

Vegetation - any plant, native or planted, living or dead; tree, shrub, bush, grass, flower, etc.

Water Tank - a container to hold water, above or below ground.

Water Main - a large pipe that carries water from its original source.

Waterway - a channel or course for water within a valve or hydrant.

Wildfire - an unplanned and uncontrolled fire spreading through vegetation, but often consuming structures or other improvements as well.

Wildlands - uncultivated land covered by forest, brush, or grass. Development is essentially nonexistent except for roads, railroads, power lines and similar facilities, or remote structures used for

recreation or timber production. Not fallow lands.

WRI - Wildland Residential Interface. See Section 102.

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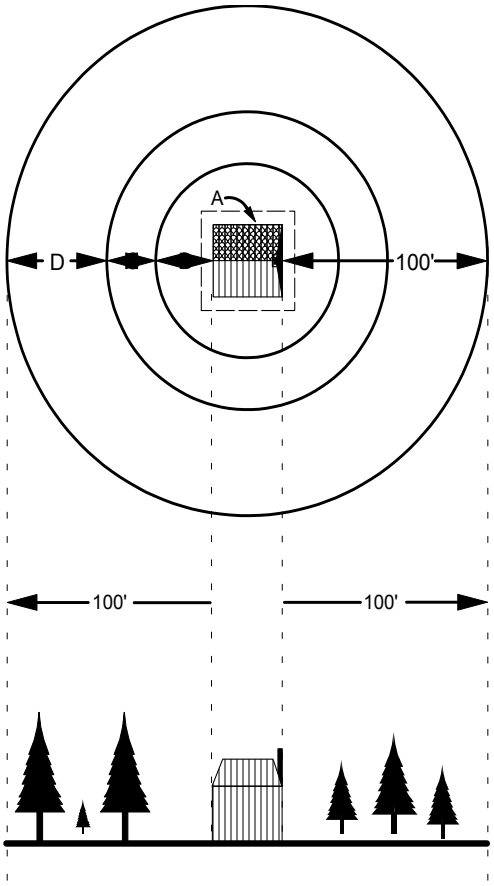
VEGETATION REDUCTION GUIDELINES
0% TO 10% SLOPE



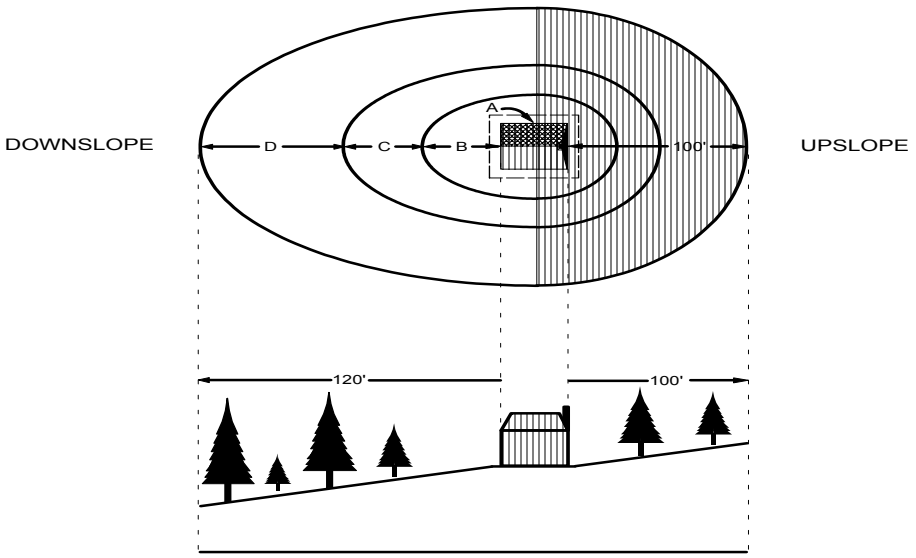
A = THE FIRST 3 FEET OF B
Maintain an area of non-combustible material - flowers, plants, concrete, gravel, mineral soil, etc.

B = 10 FEET
Remove all trees and downed woody fuels.

C = 20 FEET
Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Maintain surface vegetation at 3 inches or less.
Remove all downed woody fuels.

D = 70 FEET
Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Remove all downed woody fuels more than 3 inches in diameter.

VEGETATION REDUCTION GUIDELINES
10% TO 20% SLOPE



The shaded areas (upslope) of B, C, & D remain a constant distance of 10', 20', and 70' respectively. The shaded area begins from the mid-section of a structure. The unshaded areas (downslope) of B, C, & D increase with slope as detailed below:

A = THE FIRST 3 FEET OF B
Maintain an area of non-combustible material - flowers, plants, concrete, gravel, mineral soil, etc.

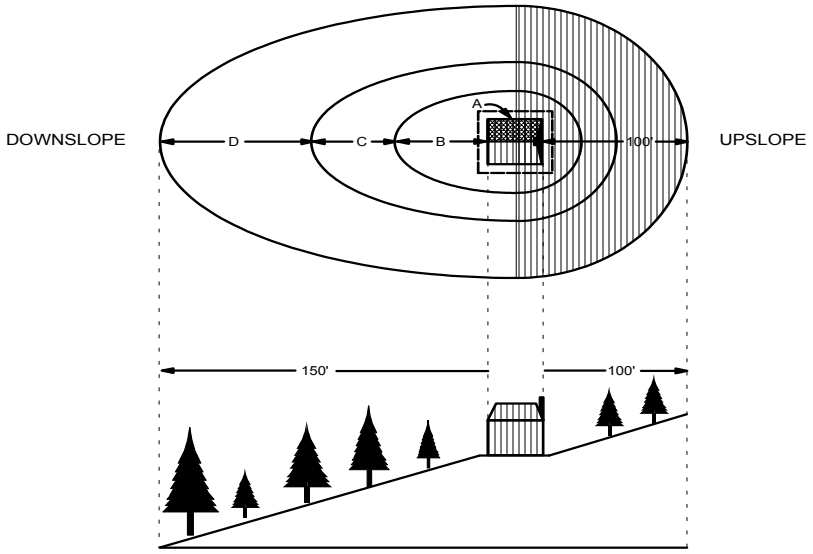
B = 15 FEET
Remove all trees and downed woody fuels.

C = 25 FEET
Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Maintain surface vegetation at 3 inches or less.
Remove all downed woody fuels.

D = 80 FEET
Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Remove all downed woody fuels more than 3 inches in diameter.

VEGETATION REDUCTION GUIDELINES

20% TO 30% SLOPE



The shaded areas (upslope) of B, C, & D remain a constant distance of 10', 20', and 70' respectively. The shaded area begins from the mid-section of a structure. The unshaded areas (downslope) of B, C, & D increase with slope as detailed below:

A = THE FIRST 3 FEET OF B

Maintain an area of non-combustible material - flowers, plants, concrete, gravel, mineral soil, etc.

B = 20 FEET

Remove all trees and downed woody fuels.

C = 30 FEET

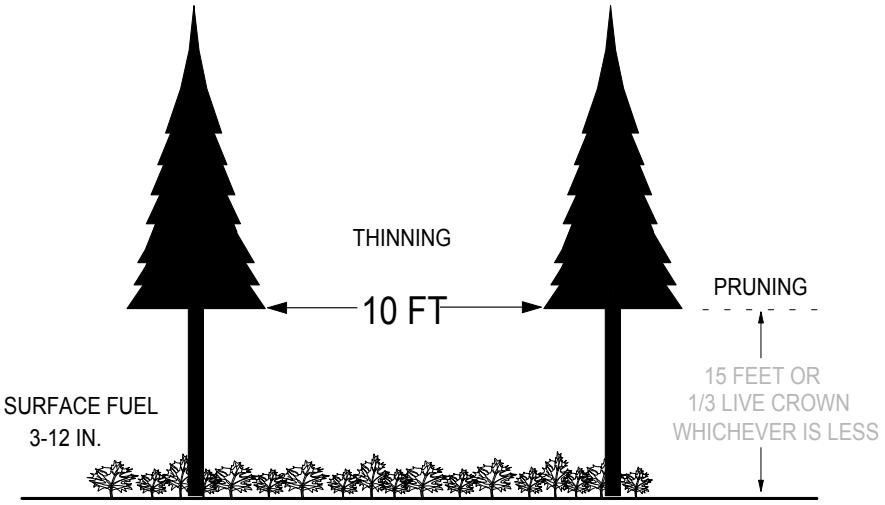
Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Maintain surface vegetation at 3 inches or less.
Remove all downed woody fuels.

D= 100 FEET

Thin trees to 10 feet between crowns.
Prune limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.
Remove all downed woody fuels more than 3 inches in diameter.

VEGETATION REDUCTION GUIDELINES

THINNING AND PRUNING



In areas where vegetation modification is prescribed, use the following guidelines:

A THINNING

Thin trees to 10 feet between crowns.

B. PRUNING

Prune the limbs of all remaining trees to 15 feet or one-third the total live crown height, whichever is less.

C. SURFACE VEGETATION

Maintain surface vegetation at 3" to 12" as detailed.